DOCUMENT RESUME

ED 075 021 JC 730 091

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TITLE General Systems Theory Provides a Conceptual Scheme for the Classification of Variables in Future Research Designs.
PUB DATE Feb 73
NOTE 19p.; Paper presented at American Educational Research Association Meeting (New Orleans, Louisiana, February 25-March 1, 1973)

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Community Colleges; *Input Output Devices; Post Secondary Education; *Program Descriptions; *Research Design; *Research Projects; *Systems Approach; Technical Reports

ABSTRACT

The growth of research in the community college field is reviewed. The need for a general systems approach to classifying and crganizing research designs is stressed. A taxonomy is proposed with major categories of input, process, and outcome variables. A community college is considered ideal for "open systems." The practical value of this taxonomy is demonstrated in an actual case explcring the role of a community college department chairman. (RS)

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A TAXONOMY FOR COMMUNITY COLLEGE RESEARCH VARIABLES

General Systems Theory Provides A Conceptual Scheme For The Classification Of Variables In Future Research Designs

by

Albert B. Smith

Given the multiplicity of studies in the community college field, how can future duplication be avoided? Can new ways be found to make studies cummulative? What methods will determine the need for additional studies? These are the questions that I wish to address myself to today. It is my belief that a taxonomy of research variables will provide a way for us to answer these questions. The purpose of this paper then will be to: (1) review the present growth of research in the community college field, demonstrating the need for a taxonomy (2) define the field of "general systems theory" and the major concepts found in that school of thought (3) outline a taxonomy for community college research variables using these concepts and (4) describe a recent research project that used this new taxonomy in its investigation of the role of the community college department chairman.

PRESENT STATE OF THE ART

The topic of research has become a prominent subject in recent years in our field. The ERIC Clearinghouse for Junior Colleges, for example, has recently published a Topical Paper devoted to the subject of institutional research.[1] This particular report shows that many community colleges are devoting time and energy to research in their institutions. Also, studies during the sixties have found that the number of two-year colleges with formal institutional research programs has steadily increased.[2] Theodore Van Istendal reported that over one-third of the colleges he studied had some form of institutional research program.[3]

JC 730 091

UNIVERSITY OF CALIF.
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MAY 11 1973

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INFORMATION

Research on community colleges is an increasingly popular topic for investigations by students and faculty in our university communities. Franklin Parker and Ann Bailey, along with John Roueche, have compiled bibliographies containing over 700 doctoral dissertations that were completed between 1918-1966. All of these research projects dealt with some aspect of community colleges.[4] More recently the August/September 1970 issue of the Junior College Journal described 182 doctoral student dissertations in progress and 166 dissertations completed that same year.[5] Thus, one can see that the number of studies in this field is growing at a phenominal rate.

Community college faculty members and administrators are also becoming more involved in research projects through the encouragement of their administrators and directors of institutional research. A good example of this increasing involvement in applied and basic research can be found in the Institute of Higher Education's Inter-institutional Research Council at the University of Florida. Through the work of this Council and its twenty-one participating Florida community colleges, numerous staff members in Florida's community colleges have participated in state-wide and local research investigations. Another good example of staff member interest in research can be found at Santa Fe Junior College in Gainesville, Florida. At Santa Fe the director of the college's Office of Research publishes an annual report of faculty, administrative staff member, student and graduate student research projects conducted at the college. Last year the report contained descriptions of 50 projects ranging from staff member dissertations to college-wide research projects.[6]

NEED FOR A TAXONOMY

With this increased emphasis on research, one might ask the question, "Isn't there a need for a way of organizing, classifying, and ordering the many variables found in community college research designs?" The above review of the rapid increase in research studies suggests that there is such a need. We need a research model that will provide a method for categorizing the numerous variables and variable relationships found in past, present and future research designs. Without such a taxonomy or conceptual framework, it is likely that a great deal of future effort may be expended in unnecessary research duplication. A number of studies, for example, have already shown that community colleges typically experience high attrition rates in their developmental education programs.[7] Is it necessary that we continue to rediscover the wheel time and again in our research?

It is true that a wide variety of very useful research models have been utilized in the community college field. They range from role theory to case studies to rather complex mathematical constructs. It would appear, however, that previous studies of organizations, roles, curriculum, and students have not produced a standard taxonomy for all conceivable research variables. A taxonomy that could be adopted by future investigators, regardless of their research design or methodology, has yet to be devised.

GENERAL SYSTEMS THEORY

During the last two decades a school of thought has developed that promises to provide a solution to the problem of variable classification. That school of thought is best known today as "general systems theory". In 1956 Ludwig von Bertalanffy and a group of scholars formed the Society for General Systems Research in Ann Arbor, Michigan. Today, the Society's yearbook, General Systems,

provides an excellent source for persons who are interested in general systems theory and its application in research. According to von Bertalanffy, general systems theory is a new discipline, "Its subject matter is the formulation and derivation of those principles which are valid for 'systems' in general."[8] Organizations, according to von Bertalanffy, are to be viewed as "open" and not "closed" systems. General or modern systems theory, according to Walter Buckley, can be viewed as the result of a broad shift in scientific perspective over the last few centuries. The shift has been from a "mechanistic" view of matter on the part of both physical and biological scientists to an "organic" or "holistic" view.[9]

The influence of general systems theory on the analysis of organizations today is quite apparent. Daniel Katz and Robert Kahn, for example, have defined organizations as "open systems" and have taken the position that theoretical concepts should begin with the input, output, and functioning of the organization as a system.[10] For research purposes, community colleges, as essentially human organizations, may also be viewed as open systems. Certainly the two-year college possesses the "open system" characteristics which Katz and Kahn have ascribed to all organizations:

> Organizations as a special class of open systems have properties in common with all open systems. These include the importation of energy from the environment, the through-put or transformation of the imported energy into some form which is characteristic of the system, the exporting of that product into the environment and the re-energizing of the system from sources in the environment.[11]

A community college derives its energy from such inputs as student, faculty member, and financial resources. The through-put or transformation processes of community colleges are the activities associated directly or indirectly with the education of its students. Finally, the most important output of the college system is the educated or trained student.

Today, I wish to propose that we adopt a uniform taxonomy for research variables in the community college field. A taxonomy that employs tne dynamic concepts of the "open" or "general" systems theorist. The major categories of this taxonomy are the inputs, processes and outcomes of community colleges. John D. Millett has already proposed a systems analysis approach, using "open system" concepts, for the study of universities.[12] My own research in the community college field suggests that a taxonomy based on system theory concepts can be very helpful in identifying variables for investigation. I shall now proceed to a description of my taxonomy.

THE CONCEPTUAL SCHEME - A TAXONOMY FOR COMMUNITY COLLEGE RESEARCH VARIABLES

The conceptual scheme outlined on the next page is a schematic diagram of the taxonomy I am proposing. I shall now define each of the taxonomies major categories and sub-categories for you.

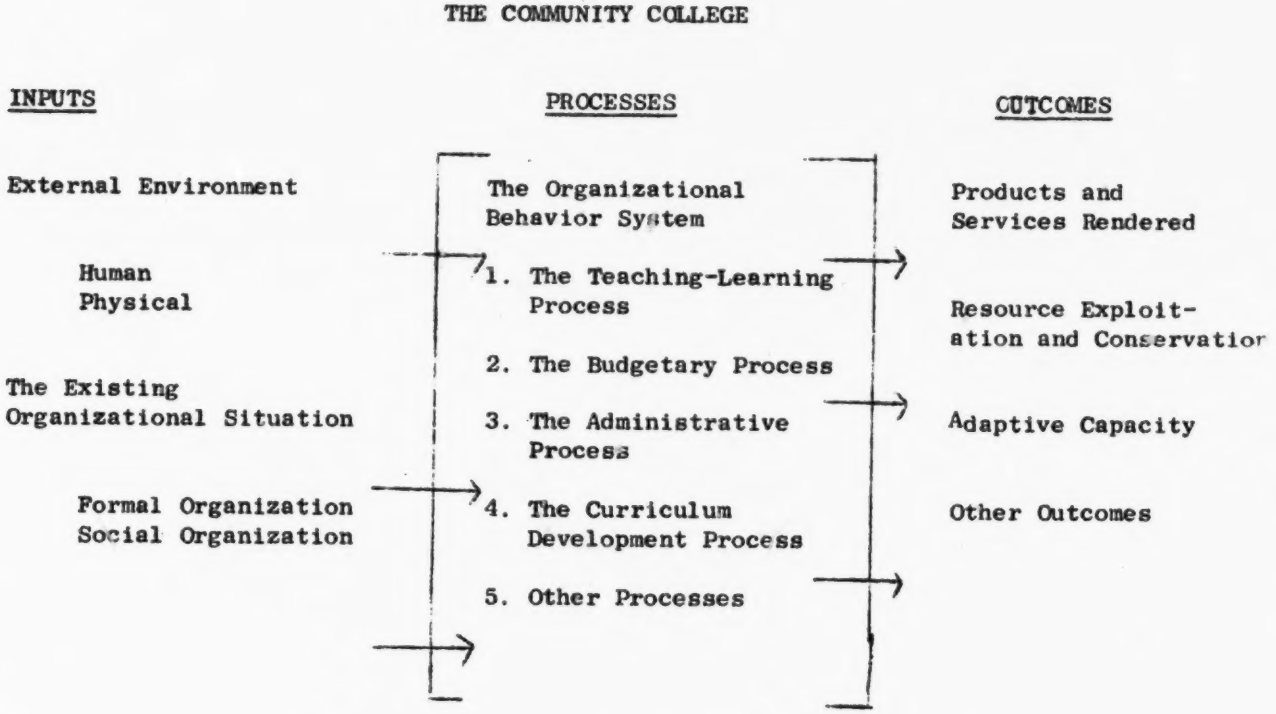

Figure 1 - A SYSTEM THEORIST'S TAXONOMY FOR RESEARCH VARIABLES FOUND IN COMMUNITY COLLEGES AND THEIR SUBSYSTEMS

INPUT CLASSIFICATION SCHEME

I am proposing that researchers should attempt to classify their research variables in terms of the taxonomy's major categories: 1) input 2) process and 3) outcome variables. Input variables are defined as those research variables which put power or energy into a college system for storage or for conversion of characteristics. As "open systems" community colleges or their departmental or unit subsystems are affected by at least two types of inputs, i.e., inputs originating in either the external or existing organizational environment. The investigator then who uses this taxonomy will also have to identify his input variables in terms of their environmental origin.

Variables originating in the external environment of a community college may be categorized as being either "human" or "physical" in nature (other subcategories will no doubt be developed as this taxonomy is improved upon). Some examples of measurable "human" inputs that have been examined in previous research studies include: 1) student, faculty and/or administrator personality characteristics 2) enrollment figures 3) student and/or teacher expectations and 4) community demographic data. Physical inputs might include such variables as: 1) the amount of funds allocated for a college's operating expenses 2) average dollars spent per full-time equivalent student and 3) characteristics of the college's physical plant facilities. These are but a few of the many hundreds of research variables that may originate in a college's external environment.

By classifying research variables according to input, process, and outcome categories, the investigator will be able to determine the comprehensiveness of his research design. In the past too many of our research designs have concentrated on variable analysis in only one category of this new taxonomy. For example, we

have studied the outcomes of community colleges in terms of student retention or successful transfer rates without attempting to determine the relationships between these outcomes and selected input and/or process variables. Future investigators can use this new taxonomy to assure consideration of input, process and outcome variable relationships.

The "existing organizational situation" of a community college, as depicted in Figure 1, is the second input subcategory in the taxonomy. Variables originating in the existing environment of a college may be classified as coming from either the "formal" or "social" organizational setting. Formal organization inputs might include such measurable items as: 1) average class size 2) administrator span of control and 3) organizational or committee structures. The formal organization is defined here as those structures that have been established for carrying out the functions, purposes, and programs of the two-year college. It is differentiated from the social organization of the college in that it has been established through policy decisions made by members of the academic community. The college's social organization on the other hand consists of the interpersonal relationships found among the participants in the system. Examples of some research variables that would be classified under the "social organization" input category include: 1) the college climate as perceived by faculty, students, or administrators 2) the number of student-faculty contacts outside of the college classroom 3) the informal decision making process of the college or 4) the nature of faculty - administrator interaction patterns.

This has been a brief description of the input classification scheme of the proposed taxonomy. Such a classification scheme will require refinement and expansion as it is implemented in the community college field. It does, however,

provide a conceptual framework for ordering the many input variables found in community college research studies.

PROCESS CLASSIFICATION SCHEME

The second major taxonomy category for classifying research variables is that of "process". A process variable is defined here as "a series of actions or operations conducing to an end". Processes in the two-year college should be thought of as cycles of events or activities of units or subunits of the community college system. The teaching-learning process is an excellent example of one type of process that is likely to continue to receive research attention in our field. It is a process that may be studied in relationship to a host of input and/or outcome variables. Some examples of teaching-learning process variables include: 1) various methods of instruction 2) verbal and non-verbal interaction patterns in the classroom 3) methods employed by teachers in evaluating and rewarding student achievement or growth and 4) student-teacher goal setting procedures.

Other process categories depicted in the taxonomy include: 1) the budgetary process 2) the administrative process and 3) the curriculum development process. These processes have been outlined in my taxonomy to illustrate some potential categories for ordering and classifying process variables. Other "process" categories will no doubt be developed and refined. A very useful study would be for someone to classify all of the previous research findings and conclusions in the community college field according to the taxonomy outlined here. The classification of previous research findings in terms of input, process, and outcome variable relationships would help to reduce research duplication. It would also provide the community college field with a research topology that is badly needed.

Let us examine for a minute some process variables that would fall under the subcategories of: 1) the budgetary process 2) the administrative process and 3) the curriculum development process. Key process variables in the budgetary area might be: 1) the nature of faculty and administrative involvement 2) the type of budgetary and accounting practices used in a college and 3) the descrepancy between actual and expected budgetary practices. A future research project focusing on the administrative processes of community colleges might examine the following variables: 1) management styles employed 2) the nature of administrative decisions and 3) methods used in resolving conflict. Finally, the process of curriculum development could provide the future researcher with yet another set of process variables. For example, as curriculums are developed for new students in higher education, it will be necessary to explore such variables as: 1) the nature of student involvement in curriculum development 2) new student reactions to traditional curricular programs and 3) the nature of personal interactions in curriculum development.

OUTCOME CLASSIFICATION SCHEME

The taxonomy I am outlining depicts still another classification category, i.e., the outcomes of the college. Outcome is defined here as "any final consequence or result of the community college system". Traditionally, outcome variables in community college research studies have focused on either "student outcomes" or "college services". Such variables as the: 1) number of A.A. degrees granted 2) number of transfer students successfully completing a four-year degree and 3) the grade point averages of community college students are all good examples of the more traditional "product" outcomes mentioned in the literature. These "product" outcomes will continue to be important "success measures" for our community

colleges. However, the proposed taxonomy suggests that there are other outcome variables that can be used to measure effectiveness. Outcome categories in the taxonomy include: 1) services rendered 2) resource exploitation and conservation and 3) the system's adaptive capacity. Researchable variables that would fall under the "services rendered" category would include: 1) the number of faculty talks given in a community 2) the number of counselor contacts made with students and 3) the number and quality of a college's community projects.

At a time when college's are being held accountable for their programs, it would seem appropriate to examine some research variables that would fall under the "resource exploitation or conservation" category. One measure of a college's conservation of its faculty resources could be the college's average student-credit-hour load per faculty member. The third taxonomy outcome category seen in Figure 1 is the college's "adaptive" capacity. Some examples of research variables that could be examined under this classification could include: 1) the number of successful new innovations tried in a college 2) the number of courses dropped from a college's catalog over a period of time or 3) the kinds of personnel changes made in a college in a year's time. A community college's ability to adapt to a changing community environment may prove to be one of the more important outcome variables in future research designs.

In this section, I have attempted to outline and define a new taxonomy for research variables found in community college research designs. The computer now makes it possible for us to examine in one study the strength and direction of the relationships between many input, process, and outcome variables.

PRACTICAL APPLICATION OF THE NEW TAXONOMY

The practical value of this new taxonomy has been demonstrated. In a recent research project, this taxonomy was used to investigate the role of the community college department chairman.[14] One of the major purposes of this study was to explore the strength and direction of the relationships between selected input, process, and outcome variables identified in the departmental subsystems of community colleges. Twelve public community colleges were selected for inclusion in the study from a mid-western state by means of a stratified random sampling plan. All of the faculty members, department chairmen, and upper echelon administrators were surveyed in these institutions. A total of 336 faculty members, 108 department chairmen, and 41 deans or college president questionnaires were analyzed in the research report. Seventy-one college departments were chosen for the project's correlation analysis of departmental input, process, and outcome variables.

Three questionnaires were developed, one for each of the sample populations. A major section of each of these questionnaires was comprised of 46 department chairman job responsibility or activity statements. Respondents were asked to indicate the actual behaviors which they perceived their chairman performing. They were also asked to describe the role behaviors expected of their chairmen on these 46 items. Data collected from this part of the questionnaire provided measurements of two process variables, i.e., 1) role consensus and 2) role conformity. Additional data collected from responses to other segments of the survey questionnaire provided objective measures of the investigation's remaining variables.

Figure 2 on the next page shows how the new taxonomy was used to classify research variables in this study.

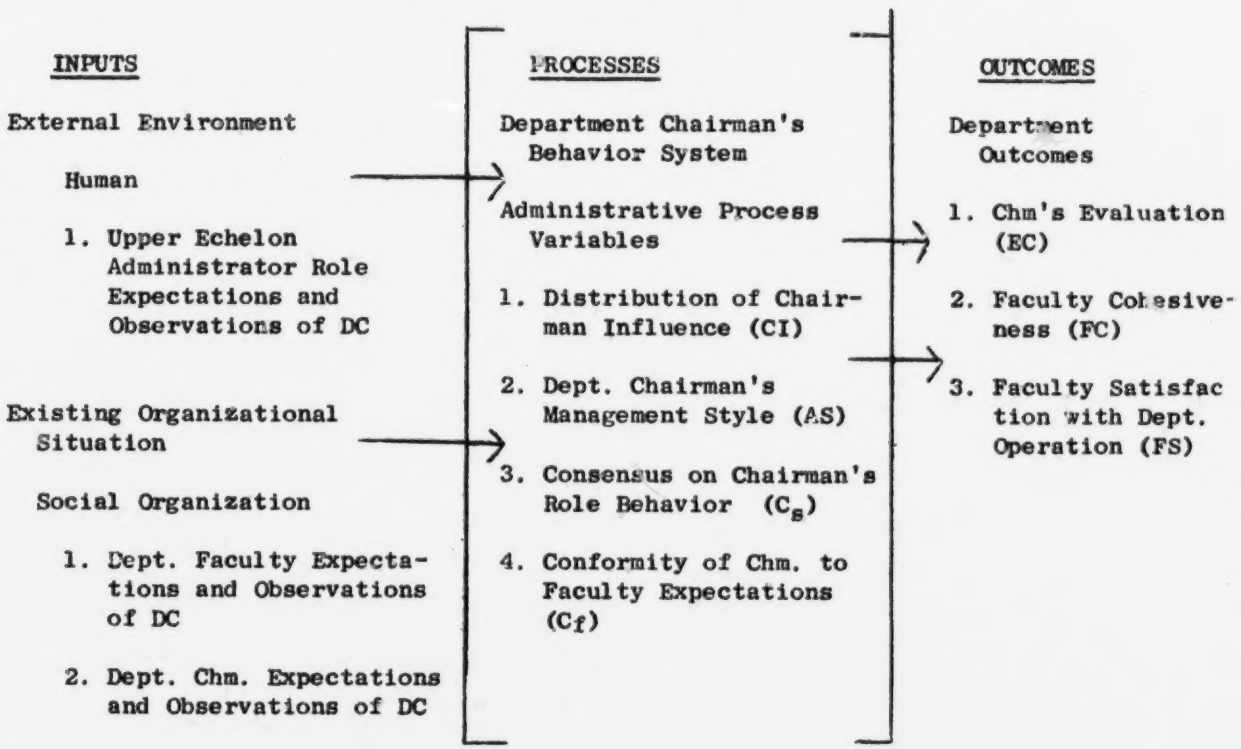
THE COMMUNITY COLLEGE DEPARTMENT
INPUTS
External Environment
Human
1. Upper Echelon Administrator Role Expectations and Observations of DC
Existing Organizational Situation
Social Organization
1. Dept. Faculty Expectations and Observations of DC
2. Dept. Chm. Expectations and Observations of DC
PROCESSES
Department Chairman's Behavior System
Administrative Process Variables
1. Distribution of Chairman Influence (CI)
2. Dept. Chairman's Management Style (AS)
3. Consensus on Chairman's Role Behavior (C_s)
4. Conformity of Chm. to Faculty Expectations (C_f)
OUTCOMES
Department Outcomes
1. Chm's Evaluation (EC)
2. Faculty Cohesiveness (FC)
3. Faculty Satisfaction with Dept. Operation (FS)

Figure 2 - A SYSTEM THEORIST'S TAXONOMY FOR SELECTED RESEARCH VARIABLES FOUND IN COMMUNITY COLLEGE DEPARTMENTS

Three input variables were chosen for the study. These included the deans' and presidents', department chairmen's, and department faculties' expectations for and observations of the actual role behavior of their chairmen. The upper echelon administrators' (deans and college presidents) expectations and observations were classified in the new taxonomy as coming from an environment external to the departmental subsystems. The role expectations and observations of department chairmen and department faculty members were viewed, however, as originating in the social climate of the existing departmental structure.

The four process variables identified in Figure 2 were all considered to be administrative process items. I shall not attempt to describe in detail the methods used in calculating scores for these variables. My purpose is merely to demonstrate that the taxonomy can be employed to classify and order research variables in an actual research design. The amount of department chairman influence on departmental decisions (CI) was the first administrative process variable. Each department faculty member was asked to indicate how much influence his chairman had over what went on in his particular department. The second administrative process variable was a measure of the chairman's administrative style (AS). Each department faculty member indicated the nature of his chairman's leadership style by responding to a series of management behavior questions on the survey instrument. Consensus in the departments on the chairman's actual role behavior ($C_{\dot{s}}$) was the third process variable. Consensus between the chairman and his departmental faculty on the chairman's actual role behavior ($C_{\dot{s}}$) was defined as a summary score of the square of the difference between the chairman's observation of his behavior and the mean observation response of his department faculty over the study's 46 activity statements. The final process variable, chairman conformity to department faculty

expectations (CF), was defined as a summary score of the mean absolute difference between faculty expectations for and faculty descriptions of their chairman's actual behavior on the same 46 statements.

The three departmental outcomes depicted in Figure 2 were: 1) the department faculty's evaluation of their chairman (EC) 2) the group cohesiveness of the department faculty (FC) and 3) the department faculty's satisfaction with the way their department functioned (FS). The department faculty's evaluation index of its chairman (EC) was the department faculty's mean response to thirteen evaluation items. A department faculty cohesiveness measure (FC) was achieved by calculating the department faculty's mean response to five questions on faculty cohesiveness. The index of faculty satisfaction was the mean response of the department faculty to six satisfaction items on the questionnaire.

The Pearsonian correlation coefficient served as the measure of the relationship between the pairs of process and outcome variables outlined above. The confidence level for statistically significant relationships among the process and outcome variables in this study was set at the .05 level. The null hypothesis tested was that there was no significant relationship between the four administrative process items and the three department outcome variables. A major limitation of this study was its reliance on simple correlation techniques between pairs of variables.

The results of the correlation analysis are presented in Table 1, below.

Table 1 - CORRELATIONS OF SELECTED ADMINISTRATIVE PROCESS VARIABLES WITH COMMUNITY COLLEGE DEPARTMENTAL OUTCOMES

Variables	AS	C_s	C_f	CI
EC	.77*	.59*	.82*	.48*
FC	.72*	.31*	.48*	.15
FS	.76*	.42*	.62*	.26*

[1] Interpretations of Symbols

AS = Chairman's administrative style
C_s = Department faculty consensus on the chairman's role behavior
C_f = Chairman conformity to faculty expectations
CI = Chairman influence on departmental decisions
EC = Department faculty evaluation of the chairman's performance
FC = Department faculty cohesiveness
FS = Department faculty satisfaction with the way their department functions.

* Significant at .05 level.

Based on the study's findings, the null hypothesis was rejected. The significant positive correlations between the chairman's administrative style (AS) and the three departmental outcomes (EC, FC, and FS) led to the conclusion that community college departments with more democratic leaders tend to be the same departments that have: 1) chairmen who receive higher faculty ratings 2) more cohesive faculty work groups and 3) faculties who express higher satisfactions regarding the way their departments function. In terms of an administrative theory, it would appear that a collegial pattern of departmental government offers a productive approach for chairmen in community colleges.

The value of role consensus (C_s) in the chairman's department is demonstrated by the positive and significant correlations between this process variable and the three department outcome measures. Departments characterized by higher consensus between chairmen and their faculties tended to be those units with: 1) higher chairmen ratings 2) higher faculty cohesiveness and 3) higher faculty satisfaction. The correlations (.82, .48 and .62) presented in Table 1 also show that departments with chairmen who conform more nearly to faculty role expectations tend to also have higher outcome scores. These particular findings suggest that a community college chairman may wish to seek greater amounts of consensus between himself and his faculty on his job responsibilities than he has in the past. Conformity to faculty expectations for his role behavior would also appear to be a desirable goal for a chairman to seek.

Finally, the positive and statistically significant correlations between the chairman's influence (CI) and two of the outcome measures should be noted. Chairmen who demonstrated a greater amount of influence over the way their departments were run tended to be the same chairmen who received higher faculty evaluations and directed faculty groups who were satisfied with departmental operations. This last finding is an important one. It suggests that the "pattern of influence distribution" in a college has implications for the chairman's evaluation.

I hope that a description of my use of the proposed taxonomy has helped you to see its practical value for your own research. The "Smith Taxonomy for Research Variables" may never reach the stature that Benjamin Blooms' taxonomy for educational objectives has achieved.[14] But after all, it did take Bloom and his associates over 15 years to achieve the recognition that is accorded them today. I am a patient man.

CONCLUSIONS AND RECOMMENDATIONS

This has been a brief discussion of a new taxonomy for community college research variables. I have reviewed the status of research in the community college field and attempted to show the need for a taxonomy as the number of research projects increases. A taxonomy has been outlined using some of the major concepts found in "general systems theory". Finally, I have described a recent research project that employed the proposed taxonomy in its analysis of the role of the community college department chairman.

The taxonomy depicted here offers a method for classifying and ordering the many research variables found in past, present and future research designs. It is a classification scheme that can be employed by directors of institutional research, faculty members, administrators, and graduate students. The uniform adoption and application of this taxonomy in this field should provide investigators with a way of identifying new research problems and reducing research duplication. More cummulative studies will be possible in our field if research findings can be classified according to a universally accepted classification model. I hope that you will find the "Smith Taxonomy" helpful.

Footnotes

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